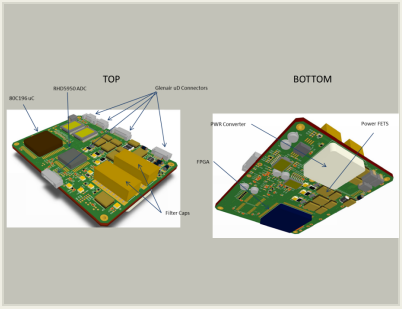
Dual Axis Controller for Extreme Environments, Phase II

Completed Technology Project (2016 - 2018)

Project Introduction

The Dual Axis Controller for Extreme Environments (DACEE) addresses a critical need of NASA's future exploration plans to investigate extreme environments within our solar system. These destinations include asteroids, comets, Phobos and Deimos, Titan, Ganymede, Mars and the Moon. Feasibility of these proposed missions is improved if subsystems can be designed to be more robust in operations and survivability such as to reduce the burden of the overall system and preserve critical resources (i.e. power and mass). In the case of DACEE, the ability to operate a functional electro-mechanical subsystem at temperatures at or below -190C addresses one of NASA's technology hurdles. In Phase 1, a two-axis compact brushless/stepper motion control design was completed with extreme cold operations maintained as the primary design driver. Individual components of the design were evaluated for risk in achieving these goals. The highest risk components were thermally tested. The results of these tests almost completely retired the risk of one component, pending further evaluation, and identified a coherent development path to remedy power regulation needs at extreme temperatures. The objectives of Phase 2 are to deliver a prototype flight-like electromechanical instrument mechanism which includes the fully developed 100 krad tolerant DACEE. This subsystem will have been cryogenically tested and characterized. The motors, gear boxes, and actuated components will be selected by leveraging the best in family for cryogenic operations. The specification of the mechanism will pay close attention to design criteria compatible with achieving significant lifetime actuation cycles based upon appropriate material selections and lubrication approaches. The objective of the Phase 2 activity is to produce a complete instrument mechanism prototype with motion control electronics capable of surviving 100 million revs at the motor.



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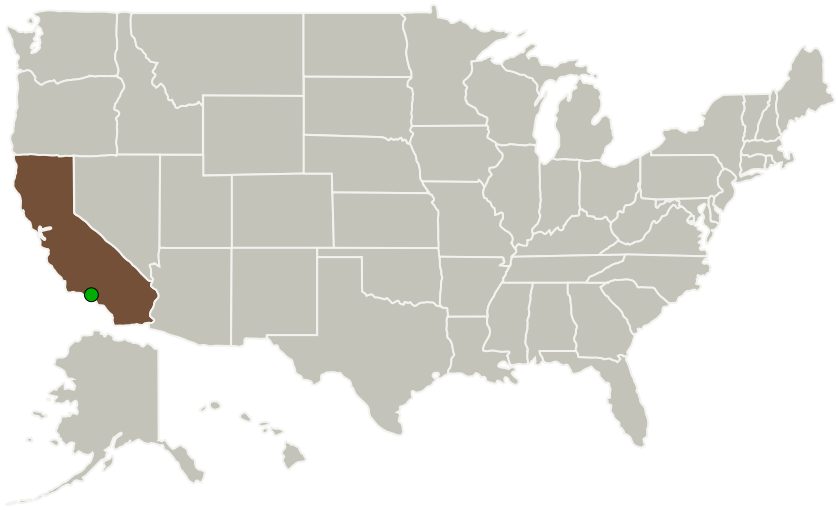
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Motiv Space Systems, Inc.	Lead Organization	Industry	Pasadena, California
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations
California

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Motiv Space Systems, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

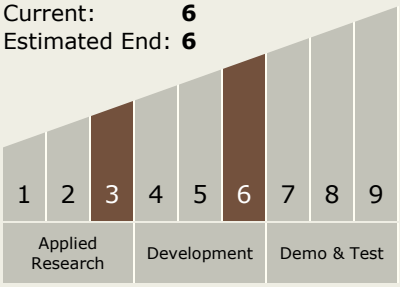
Carlos Torrez

Principal Investigator:

Greg Levanas

Technology Maturity (TRL)

Start: **3**
Current: **6**
Estimated End: **6**



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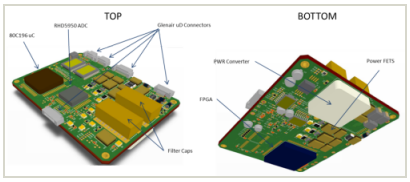
Images



Briefing Chart Image
Dual Axis Controller for Extreme Environments, Phase II
(https://techport.nasa.gov/image/130401)

Technology Areas

Primary:

- TX04 Robotic Systems
  - TX04.2 Mobility
    - TX04.2.4 Surface Mobility

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System